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Social relations in groups of Black-capped capuchin monkeys, (*Cebus apella*) in captivity: sibling relations from the second to the fifth year of life

By C. Welker, Hella Höhmann-Kröger, and G. A. Doyle

Zoologie und vergleichende Anatomie – Primatenethologie –, Universität Kassel, FRG

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Abstract

For juvenile black-capped capuchin monkeys brothers and sisters (related through the mother) are, after the mother herself, the most attractive social partners to one another within the social group. They approach, are approached, and sit together with their respective brothers or sisters significantly more often than with other members of the social group, irrespective of age and sex. The same is true for grooming and social play. In addition juveniles are more interested in their same-sex siblings than in their opposite-sex siblings.

Introduction

Long-term studies of some primate species living in large social groups reveal that, after the mother, juveniles prefer siblings as their social partners. Generally, close kin are more attractive as social partners than lesser or non-related individuals. This is true for *Macaca mulatta* (Sade 1965; Drickamer 1976; Kaplan 1978; Chepko-Sade and Sade 1979; Berman 1982), *Macaca nemestrina* (Massey 1977; Wade 1979), *Macaca fuscata* (Kurland 1977; Glick et al. 1986a, b), *Macaca arctoides* (Estrada and Sandoval 1977), *Macaca fascicularis* (De Waal 1977; Welker and Lührmann 1982a, b; Welker and Witt 1982), and *Theropithecus gelada* (Dunbar 1978, 1980, 1982). It has been suggested that such a preference is widespread throughout the primate order (Welker 1985), including prosimians (Taylor and Sussmann 1985). This assumption needs to be tested, particularly in New World monkeys, in which there are no comparable studies to date. Previous reports on our long-term study of black-capped capuchin monkeys, indicated that, after the mother, siblings are the most attractive social partners for infants (Welker et al. 1987, 1990a).

Since we have shown that black-capped capuchin young, irrespective of age, prefer their mothers as social partners (Welker et al. 1992), we would expect this to apply as well to their second choice of siblings as preferred social partners. Whether any preference for siblings as social partners remains stable or decreases with age, is of particular interest. It is also of importance to establish whether the choice of siblings as social partners is stronger for same-sexed than for opposite-sexed siblings.

Material and methods

The main subjects of the present study were 18 *Cebus apella* juveniles, nine males and nine females, born into the same social group at the primate station of Kassel University. During the period of time under consideration, this group consisted of up to 43 individuals. These 18 subjects provided data on 53 dyadic relationships – 12 male-male dyads, 15 female-female dyads and 26 male-female dyads in none of which the focal animal was younger than two or older than 5 years. The data were collected by focal animal observations (12 animals) or group observations (6 animals). Each focal animal was

observed daily for 15 minutes each minute being a separate entity such that if one behaviour pattern lasted 10 minutes it was scored 10 times. Group observations were conducted daily for 60 minutes each two minutes being regarded as a separate unit such that if one behaviour pattern lasted for 10 minutes it was scored 5 times. All observation sessions were conducted randomly during the period from 1500 to 1900 hours according to an established schedule. As in a previous paper (Welker et al. 1992) both data sets were combined since comparison between both methods revealed no differences between the different age/sex groups when frequency scores were converted to percentages.

Three of the 18 main subjects were observed over the whole life span covered in this paper, i.e., from year 2 to year 5. All other subjects were observed for from one to three years.

The patterns of social behaviour which occurred regularly and which were scored in terms of their frequency of occurrence per unit time, by trained observers, were the same as those reported previously (Welker et al. 1992). These were: active approach, passive approach (being approached), contact sitting, active grooming, passive grooming, social play.

The frequency of occurrence of a particular behaviour, in which a given sibling was involved with a brother or sister, was converted to a percentage for the purpose of statistical comparison with the same behaviour in which the sibling was involved with other members of the social group on the basis of an expected percentage frequency that assumed that all members of the group except the mother are equally attractive as social partners.

High percentages in the figure should be read with caution since they may represent absolute frequencies of behaviours that occur very seldom compared to others. To give sample sizes for the data sets the mean (with standard error) of the absolute frequency of the different behaviour patterns protocolled within one year is added (Tab. 1).

The statistical test used was the Mann-Whitney test with the level of statistical significance set at $p < 0.05$. The data of one individual collected over one year were taken as one independent sample for statistical purposes.

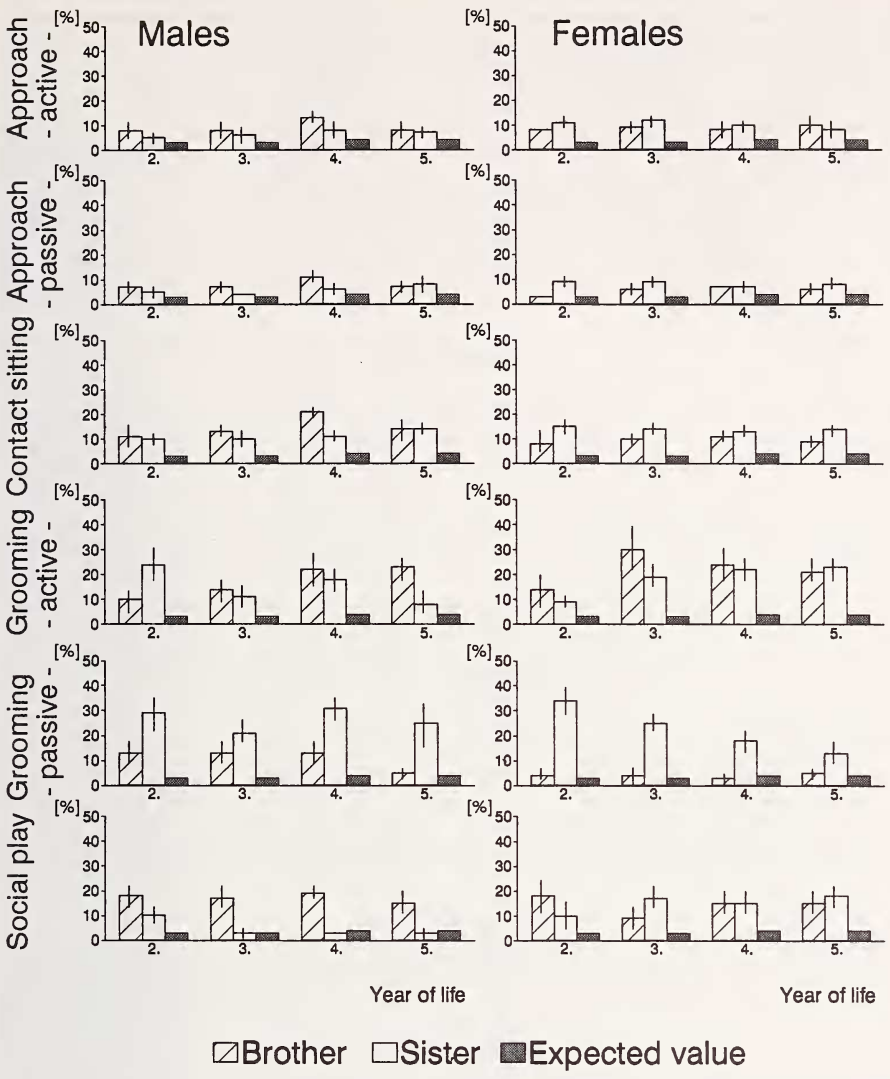
Results

Both males and females approach their brothers and sisters significantly more often than would be expected on the basis of chance alone (approach – active – in the Figure). For males this is supported statistically, from year 2 to year 5, for both their brothers (B/B) and their sisters (B/S) (Year 2, B/B $p < 0.01$ and B/S $p < 0.025$; Year 3, BB $p < 0.005$ and B/S $p < 0.005$; Year 4, B/B $p < 0.001$ and B/S $p < 0.005$; Year 5, B/B $p < 0.05$ and B/S $p < 0.05$). For females this is supported statistically for their sisters (S/S) from year 2 and for their brothers (S/B) from year 3 (Year 2, S/S $p < 0.005$; Year 3, S/S $p < 0.005$ and S/B $p < 0.005$; Year 4, S/S $p < 0.001$ and S/B $p < 0.001$; Year 5, S/S $p < 0.001$ and S/B $p < 0.001$).

As would be expected both male and female juveniles are approached (approach – passive – in the Figure) statistically more frequently by their brothers and sisters than would be expected on the basis of chance. This is true for nearly all possible dyads (for males: Year 2, B/B $p < 0.05$; Year 3, B/B $p < 0.025$ and B/S $p < 0.05$; Year 4, B/B $p < 0.001$ and B/S $p < 0.05$; Year 5, B/S $p < 0.05$; for females: Year 2, S/S $p < 0.005$; Year 3, S/S $p < 0.005$ and S/B $p < 0.005$; Year 4, S/S $p < 0.01$ and S/B $p < 0.001$; Year 5, S/S $p < 0.001$ and S/B $p < 0.001$).

The tendency for juveniles of either sex to choose their own siblings with whom to sit in close contact is even stronger than the behaviour patterns of approaching and being approached. Juvenile males and females sit in close bodily contact (contact sitting, Figure) with their brothers and sisters more often than would be expected on the basis of chance (males: Year 2, B/B $p < 0.01$ and B/S $p < 0.01$; Year 3, B/B $p < 0.001$ and B/S $p < 0.01$; Year 4, B/B $p < 0.001$ and B/S $p < 0.005$; Year 5, B/B $p < 0.05$ and B/S $p < 0.05$: females: Year 2, S/B $p < 0.05$ and S/S $p < 0.005$; Year 3, S/B $p < 0.005$ and S/S $p < 0.001$; Year 4, S/B $p < 0.01$ and S/S $p < 0.001$; Year 5, S/B $p < 0.001$ and S/S $p < 0.001$).

The Table clearly shows that the actual incidence of grooming between juvenile siblings, at least in respect of males, is so low that conversion into percentages, as illustrated in the Figure (grooming – active –), is misleading and statistical tests confirm that, in males, the choice of siblings as grooming partners, in preference to other members



Mean percentage of the frequency of occurrence of some selected behaviour patterns, together with the Standard Error of the Mean, of males toward their siblings (on the left hand side) and of females towards their siblings (on the right hand side), compared to an expected mean frequency based on the assumption that all members of the group are equally preferrable as social partners

of the social group, is insignificant. In females, on the other hand not only does grooming become important from Year 3 but male siblings become particularly important as groomees. Because of high individual differences statistics reveal that for female juveniles, from year 3 on, only their choice of sisters as groomees is significantly greater than their choice of other members of the social group (Year 3, $p < 0.05$; Year 4, $p < 0.001$: Year 5, $p < 0.05$). Male siblings only become attractive as groomees to female juveniles from Year 5 ($p < 0.05$).

As the data for Active Grooming suggests, both male and female juveniles are groomed (grooming – passive –, Figure) more frequently by their siblings, particularly their sisters,

Mean absolute values of the social relations among capuchin monkey mother-related offsprings

Behaviour pattern	Year of life	Sex	Brother (number of dyads)	Sister (number of dyads)
Approach active	2.	m	134 ± 19 (6)	91 ± 10 (10)
		f	50 (1)	132 ± 29 (5)
	3.	m	130 ± 23 (9)	85 ± 21 (11)
		f	64 ± 26 (5)	132 ± 43 (5)
	4.	m	111 ± 17 (7)	79 ± 15 (6)
		f	79 ± 20 (8)	70 ± 24 (8)
	5.	m	135 ± 37 (5)	33 ± 6 (3)
		f	91 ± 10 (9)	77 ± 22 (9)
Approach passive	2.	m	137 ± 23 (6)	105 ± 16 (10)
		f	13 (1)	91 ± 32 (5)
	3.	m	132 ± 25 (9)	73 ± 15 (11)
		f	60 ± 21 (5)	112 ± 32 (5)
	4.	m	127 ± 25 (7)	82 ± 15 (6)
		f	92 ± 24 (8)	63 ± 23 (8)
	5.	m	122 ± 28 (5)	50 ± 17 (3)
		f	100 ± 24 (9)	73 ± 21 (9)
Contact-sitting	2.	m	138 ± 42 (6)	116 ± 34 (11)
		f	216 ± 141 (3)	360 ± 89 (6)
	3.	m	221 ± 57 (9)	178 ± 41 (11)
		f	141 ± 42 (5)	202 ± 47 (9)
	4.	m	488 ± 112 (7)	240 ± 65 (6)
		f	197 ± 47 (8)	275 ± 63 (10)
	5.	m	114 ± 43 (5)	479 ± 54 (3)
		f	164 ± 40 (9)	252 ± 45 (9)
Grooming active	2.	m	3 ± 1 (6)	6 ± 3 (11)
		f	9 ± 7 (3)	6 ± 1 (6)
	3.	m	9 ± 4 (9)	8 ± 3 (11)
		f	70 ± 43 (5)	32 ± 12 (9)
	4.	m	11 ± 5 (7)	7 ± 2 (6)
		f	73 ± 30 (8)	60 ± 17 (10)
	5.	m	18 ± 7 (5)	7 ± 3 (3)
		f	78 ± 25 (9)	71 ± 24 (9)
Grooming passive	2.	m	15 ± 6 (6)	38 ± 9 (11)
		f	9 ± 9 (3)	89 ± 20 (6)
	3.	m	21 ± 8 (9)	30 ± 8 (11)
		f	6 ± 4 (5)	33 ± 9 (9)
	4.	m	23 ± 15 (7)	25 ± 3 (6)
		f	4 ± 1 (8)	26 ± 11 (10)
	5.	m	5 ± 2 (5)	52 ± 25 (3)
		f	5 ± 2 (9)	19 ± 4 (9)
Social play	2.	m	168 ± 55 (6)	41 ± 12 (11)
		f	58 ± 22 (3)	87 ± 39 (6)
	3.	m	144 ± 35 (9)	23 ± 8 (11)
		f	75 ± 24 (5)	108 ± 32 (9)
	4.	m	207 ± 45 (7)	17 ± 7 (6)
		f	98 ± 18 (8)	105 ± 33 (10)
	5.	m	91 ± 29 (5)	23 ± 23 (3)
		f	43 ± 8 (9)	70 ± 24 (9)

at all ages levels under consideration. Males are groomed by their sisters (Year 2, $p < 0.001$; Year 3, $p < 0.025$; Year 4, $p < 0.025$) and females by their sisters (Year 2, $p < 0.005$; Year 3, $p < 0.01$; Year 4, $p < 0.05$; Year 5, $p < 0.001$) significantly more frequently than by other members of the social group. Only at Year 3 are males groomed significantly more frequently by their brothers than by other members of the social group

other than their sisters ($p < 0.05$). In contrast, females are seldom groomed by their brothers, in fact, significantly less frequently than they are groomed by their sisters (Year 2, $p < 0.05$; Year 3, $p < 0.025$; Year 4, $p < 0.005$; Year 5, $p < 0.01$).

Finally, with regard to social play (social play, Figure), males play with their brothers, but not with their sisters or other members of the group, more frequently than would be expected on the basis of chance (Year 2, $p < 0.005$; Year 3, $p < 0.001$; Year 4, $p < 0.001$; Year 5, $p < 0.005$). Females, however, play significantly more frequently with their siblings of either sex than with other members of the group (Year 2, S/S $p < 0.05$; Year 3, S/S $p < 0.005$; Year 4, S/B $p < 0.025$ and S/S $p < 0.001$; Year 5, S/B $p < 0.05$ and S/S $p < 0.005$). For both males and females there is a preference for their own sex as play partners (Table).

Discussion

For male and female black-capped capuchin juveniles brothers and sisters are important social partners extending even into adulthood. Together with data on sibling relations in the first year of life (Welker et al. 1987, 1990a) a social network involving juveniles is apparent. Males prefer their brothers as play partners while females have an equal preference for brothers and sisters. Females have more affiliative contacts (contact sitting and grooming) with their siblings than do males. Similar results on sex-typical differences in juveniles are well documented within the primate order as a whole (for a review see Welker 1985). Males show a strong preference for their brothers as social partners, while females show an equally strong preference for brothers and sisters, at all age levels. Data on one hand-reared female (Welker et al. 1990b) suggest that precise genetic relatedness is not the sole criterion for social preference. All group-born, juvenile capuchin monkeys reared by their own mothers, interact more frequently with their siblings irrespective of age and irrespective of paternity. There are no reasons for believing that capuchin monkeys are able to make social distinctions as a function of degree of genetic relatedness.

The above data suggest that kin relationships are important for social cohesion in capuchin monkeys in the wild, as they are in Old World monkeys, and offer a pointer to social relationships in other New World monkeys living under similar group conditions.

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Zusammenfassung

Soziale Beziehungen in Gruppen des Gehaubten Kapuzineraffen (Cebus apella) in Gefangenschaft: Beziehungen zwischen Geschwistern vom zweiten bis zum fünften Lebensjahr

Für Jungtiere des gehaubten Kapuzineraffen sind neben der Mutter (über die Mutter verwandte) Geschwister die attraktivsten Sozialpartner in der Gruppe. Geschwister suchen sich gegenseitig häufiger auf und sitzen häufiger in engem Körperkontakt als mit anderen Gruppenmitgliedern, unabhängig vom Alter und Geschlecht. Entsprechendes gilt für die soziale Körperpflege und das soziale Spiel. Dabei bevorzugen sie gleichgeschlechtliche Geschwister.

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Authors' addresses: Prof. Dr. Christian Welker, Dr. Hella Höhmann-Kröger, Zoologie und vergleichende Anatomie – Primatenethologie –, Universität Kassel, Heinrich-Plett-Str. 40, D-3500 Kassel, FRG; Prof. Dr. Gerald A. Doyle, Primate Behaviour Research Group, University of the Witwatersrand, 1 Jan Smuts Avenue, Johannesburg, South Africa